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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/539,691 | 03/31/2000 | Takahiro Yamamoto | P/1071-1009 | 1017 |

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| EXAMINER | |
|---|---|
| STAICOVICI, STEFAN | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1732 | 29 |

DATE MAILED: 11/18/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application N . | Applicant(s) | |
|---|---|---|---|
| | 09/539,691 | YAMAMOTO ET AL. | |
| | Examiner | Art Unit | |
| | Stefan Staicovici | 1732 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the corresp ndence address --*

**Peri d for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *09 September 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disp sition of Claims**

4)☒ Claim(s) *20-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *20-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. §§ 119 and 120**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *25* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

## DETAILED ACTION

### *Response to Amendment*

1. Applicants' amendment filed September 9, 2003 (Paper No. 28) has been entered. Claims 1-18 have been canceled. No claims have been amended. New claims 19-31 have been amended. However, in view of 37 C.F.R. 1.126, the newly added claims have been renumbered as 20-32.

Claims 20-32 are pending in the instant application.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 20-21, 23-26, 28-30 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakazawa *et al.* (US Patent No. 5,948,200) in view of Funami *et al.* (US Patent No. 5,055,653).

Nakazawa *et al.* ('200) teach the basic claimed process of machining a plurality of holes having a diameter of about 50 microns (feed-through holes) (SH) (see col. 6, line 66) in a ceramic green sheet (5) at predetermined locations including, providing a pulsed laser beam from a laser source (7), passing said laser beam through a transparent mask (8) (diffraction grating) to form a plurality of beams (see col. 7, lines 30-35), reflecting said plurality of beams off a galvano-mirror (9) having two degrees of freedom and simultaneously irradiating said ceramic green sheet (5) to form a plurality of holes (feed-through holes) (SH) (see col. 7, lines 3-35 and

Figure 4). Further, Nakazawa *et al.* ('200) teach that said galvano-mirror (9) continuously changes the position of said beam by continuously changing the reflection angle in two directions (X,Y) (see col. 19, lines 8-16 and col. 20, lines 8-17) (repeatedly irradiating the ceramic green sheet...changing reflection angle of the galvano-scan mirror). Furthermore, it is submitted that in view of Applicants' remarks on page 3 of the amendment filed June 6, 2002 (Paper No. 12) that a "diffraction grating uses a large number of parallel closely spaced slits which provides a plurality of output light beams" said transparent mask (8) Nakazawa *et al.* ('200) is a "diffraction grating." Furthermore, Nakazawa *et al.* ('200) teach the use of a positioning table (35) that moves said green sheet during laser processing such that a predetermined portion is processed with a plurality of holes and then said green sheet is moved along for another predetermined portion to be exposed to laser beam processing (see col. 17, lines 27-36).

Regarding claims 20, 25 and 29, Nakazawa *et al.* ('200) do not teach using converging lens to individually converge said plurality of beams. Funami *et al.*('653) teach a laser process including, providing a laser beam (2e), splitting said laser by beam splitter (13) (forming a plurality of laser beams) and converging said plurality of laser beams (2f) using a convergent lenses (11) (see Figure 9 and col. 6, line 65 through col. 7, line 4). Therefore, it would have been obvious for one of ordinary skill in the art to have provided converging lenses for individually converging a plurality of laser beams as taught by Funami *et al.*('653) in the process of Nakazawa *et al.* ('200) because, Funami *et al.*('653) specifically teaches that such lenses provide equal laser energy densities at the machining spots, hence obtaining holes having a uniform size and shape.

In regard to claims 21, 26 and 30, Nakazawa *et al.* ('200) teach passing said laser beam through a transparent mask (8) (diffraction grating) to form a plurality of beams (see col. 7, lines 30-35).

Specifically regarding claims 23 and 28-29, Nakazawa *et al.* ('200) teach the use of a carrier film (1) (BF) (see Figure 4 and col. 7, lines 3-8). Further in regard to claim 29, Nakazawa *et al.* ('200) teach that said carrier film (1) (BF) is not penetrated by the laser (see col. 7, lines 15-19).

Regarding claims 24 and 32, Funami *et al.*('653) teach a laser process including, providing a laser beam (2e), splitting said laser by beam splitter (13) (forming a plurality of laser beams) and converging said plurality of laser beams (2f) using a convergent lenses (11) (see Figure 9 and col. 6, line 65 through col. 7, line 4) such that equal laser energy density is provided at the machining spots, hence obtaining holes having a uniform size and shape. Therefore, it would have been obvious for one of ordinary skill in the art to have provided converging lenses for individually converging a plurality of laser beams as taught by Funami *et al.*('653) in the process of Nakazawa *et al.* ('200) because, Funami *et al.*('653) specifically teaches that such lenses provide equal laser energy densities at the machining spots, hence obtaining holes having a uniform size and shape.

4. Claims 20-21, 23-26, 28-30 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakazawa *et al.* (US Patent No. 5,948,200) in view of JP 10-034365 and in further view of Funami *et al.* (US Patent No. 5,055,653).

Nakazawa *et al.* ('200) teach the basic claimed process of machining a plurality of holes (feed-through holes) (SH) in a ceramic green sheet (5) including, providing a pulsed laser beam

from a laser source (7), passing said laser beam through a transparent mask (8) (diffraction grating) to form a plurality of beams (see col. 7, lines 30-35), reflecting said plurality of beams off a galvano-mirror (9) having two degrees of freedom and simultaneously irradiating said ceramic green sheet (5) to form a plurality of holes (feed-through holes) (SH) (see col. 7, lines 3-35 and Figure 4). Further, Nakazawa *et al.* ('200) teach that said galvano-mirror (9) continuously changes the position of said beam by continuously changing the reflection angle in two directions (X,Y) (see col. 19, lines 8-16 and col. 20, lines 8-17) (repeatedly irradiating the ceramic green sheet...changing reflection angle of the galvano-scan mirror). Furthermore, Nakazawa *et al.* ('200) teach the use of a positioning table (35) that moves said green sheet during laser processing such that a predetermined portion is processed with a plurality of holes and then said green sheet is moved along for another predetermined portion to be exposed to laser beam processing (see col. 17, lines 27-36).

Regarding claims 20, 25 and 29, it is submitted that in view of Applicants' remarks on page 3 of the amendment filed June 6, 2002 (Paper No. 12) that a "diffraction grating uses a large number of parallel closely spaced slits which provides a plurality of output light beams" said transparent mask (8) Nakazawa *et al.* ('200) is a "diffraction grating." However, in order to address Applicants' concerns, the teachings of JP 10-34365 are used to show the use of a phase grating (diffraction grating) to split a laser beam into a plurality of beams. Specifically, JP 10-34365 teaches a process for forming a plurality of holes in a plate using a phase grating (9) (diffraction grating) including, providing a laser beam, reflecting said laser beam off galvano-mirror (5) having two degrees of freedom and dividing said beam into a plurality of beams using said phase grating (9) (diffraction grating). Therefore, it would have been obvious for one of

ordinary skill in the art to have provided a phase grating (diffraction grating) as taught by JP 10-34365 in the process of Nakazawa *et al.* ('200) because Nakazawa *et al.* ('200) teaches the use of a beam splitter to obtain multiple beams, whereas JP 10-34365 specifically teaches that a phase grating is preferable for splitting a laser beam. Further regarding claims 20, 25 and 29, Nakazawa *et al.* ('200) in view of JP 10-34365 do not teach using converging lens to individually converge said plurality of beams. Funami *et al.*('653) teach a laser process including, providing a laser beam (2e), splitting said laser by beam splitter (13) (forming a plurality of laser beams) and converging said plurality of laser beams (2f) using a convergent lenses (11) (see Figure 9 and col. 6, line 65 through col. 7, line 4). Therefore, it would have been obvious for one of ordinary skill in the art to have provided converging lenses for individually converging a plurality of laser beams as taught by Funami *et al.*('653) in the process of Nakazawa *et al.* ('200) in view of JP 10-34365 because, Funami *et al.*('653) specifically teaches that such lenses provide equal laser energy densities at the machining spots, hence obtaining holes having a uniform size and shape.

In regard to claims 21, 26 and 30, Nakazawa *et al.* ('200) teach passing said laser beam through a transparent mask (8) (diffraction grating) to form a plurality of beams (see col. 7, lines 30-35).

Specifically regarding claims 23 and 28-29, Nakazawa *et al.* ('200) teach the use of a carrier film (1) (BF) (see Figure 4 and col. 7, lines 3-8). Further in regard to claim 29, Nakazawa *et al.* ('200) teach that said carrier film (1) (BF) is not penetrated by the laser (see col. 7, lines 15-19).

Regarding claims 24 and 32, Funami *et al.*('653) teach a laser process including, providing a laser beam (2e), splitting said laser by beam splitter (13) (forming a plurality of laser

beams) and converging said plurality of laser beams (2f) using a convergent lenses (11) (see Figure 9 and col. 6, line 65 through col. 7, line 4) such that equal laser energy density is provided at the machining spots, hence obtaining holes having a uniform size and shape. Therefore, it would have been obvious for one of ordinary skill in the art to have provided converging lenses for individually converging a plurality of laser beams as taught by Funami *et al.*('653) in the process of Nakazawa *et al.* ('200) in view of JP 10-34365 because, Funami *et al.*('653) specifically teaches that such lenses provide equal laser energy densities at the machining spots, hence obtaining holes having a uniform size and shape.

5. Claims 22, 27 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakazawa *et al.* (US Patent No. 5,948,200) in view of Funami *et al.* (US Patent No. 5,055,653) and in further view of Derwent 1988-159505.

Nakazawa *et al.* ('200) in view of Funami *et al.*('653) teach the basic claimed process as described above.

Regarding claims 22, 27 and 31, although Nakazawa *et al.* ('200) teaches a YAG laser Nakazawa *et al.* ('200) in view of Funami *et al.*('653) do not teach a $CO_2$ laser. Derwent 1988-159505 teaches that $CO_2$ and Nd:YAG lasers are equivalent alternatives for laser drilling green ceramic sheets. Therefore, it would have been obvious for one of ordinary skill in the art to have used a $CO_2$ laser as an equivalent alternative to a YAG laser as taught by Derwent 1988-159505 in the process of Nakazawa *et al.* ('200) in view of Funami *et al.*('653) because Derwent 1988-159505 specifically teaches that $CO_2$ and Nd:YAG lasers are equivalent alternatives for laser drilling green ceramic sheets, whereas Nakazawa *et al.* ('200) teaches a YAG laser and also

because both Nakazawa *et al.* ('200) and Derwent 1988-159505 teach laser drilling of green ceramic sheets.

6. Claims 22, 27 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakazawa *et al.* (US Patent No. 5,948,200) in view of JP 10-034365 and in further view of Funami *et al.* (US Patent No. 5,055,653) and Derwent 1988-159505.

Nakazawa *et al.* ('200) in view of JP 10-034365 and in further view of Funami *et al.*('653) teach the basic claimed process as described above.

Regarding claims 22, 27 and 31, although Nakazawa *et al.* ('200) teaches a YAG laser Nakazawa *et al.* ('200) in view of JP 10-034365 and in further view of Funami *et al.*('653) do not teach a $CO_2$ laser. Derwent 1988-159505 teaches that $CO_2$ and Nd:YAG lasers are equivalent alternatives for laser drilling green ceramic sheets. Therefore, it would have been obvious for one of ordinary skill in the art to have used a $CO_2$ laser as an equivalent alternative to a YAG laser as taught by Derwent 1988-159505 in the process of Nakazawa *et al.* ('200) in view of JP 10-034365 and in further view of Funami *et al.*('653) because Derwent 1988-159505 specifically teaches that $CO_2$ and Nd:YAG lasers are equivalent alternatives for laser drilling green ceramic sheets, whereas Nakazawa *et al.* ('200) teaches a YAG laser and also because both Nakazawa *et al.* ('200) and Derwent 1988-159505 teach laser drilling of green ceramic sheets.

***Response to Arguments***

7. Applicants' remarks filed September 9, 2003 (Paper No. 28) have been considered. In view of Applicants' amendment filed September 9, 2003 (Paper No. 28) the rejections based on the teachings of JP 10-034365 and Wang (US Patent No. 5,293,025) have been withdrawn.

Applicants argue that Nakazawa *et al.* ('200) teach that "light transmitting portion 8 includes only a single hole...and *clearly fails* (emphasis added) to teach or suggest any plurality of laser beam components, let alone a diffraction grating for splitting a laser" (see page 7 of the amendment filed September 9, 2003). In response, it should be noted that throughout prosecution of the instant application it has been shown that Nakazawa *et al.* ('200) teach passing said laser beam through a transparent mask (8) (diffraction grating) to form a plurality of beams (see col. 7, lines 30-35). Specifically, Nakazawa *et al.* ('200) teach that if "a plurality of holes are formed in the mask 8 and a plurality of laser beams simultaneously irradiate the magnetic green sheet 5, the period of time needed to form the through holes is reduced" (see col. 7, lines 30-35). Therefore, it is submitted that if a plurality of holes exist in the mask then the mask functions as a beam splitter because a plurality of beams is obtained as explicitly taught by Nakazawa *et al.* ('200).

Applicants argue that Nakazawa *et al.* ('200) "*clearly fails* (emphasis added) to teach or suggest...a plurality of holes that are formed simultaneously" (see page 8 of the of the amendment filed September 9, 2003). However, as shown above, Nakazawa *et al.* ('200) explicitly teach that if "a plurality of holes are formed in the mask 8 and a plurality of laser beams *simultaneously irradiate* (emphasis added) the magnetic green sheet 5, the period of time needed to form the through holes is reduced" (see col. 7, lines 30-35). Therefore, it is submitted that if a plurality of holes exist in the mask, a plurality of beams are formed that simultaneously irradiate the green sheet and as such reduce processing time and enhance productivity as explicitly taught by Nakazawa *et al.* ('200).

Applicants argue that Nakazawa *et al.* ('200) "fails to teach or suggest that the table 6 could or should be shifted" (see page 8 of the of the amendment filed September 9, 2003). However, Nakazawa *et al.* ('200) specifically teach the use of a positioning table (35) that moves said green sheet during laser processing such that a predetermined portion is processed with a plurality of holes and then said green sheet is moved along for another predetermined portion to be exposed to laser beam processing (see col. 17, lines 27-36). It is submitted that within each predetermined portion a plurality of holes are processed.

Applicants argue that "[N]one of the plurality of converging lenses 11 of Funami et al. converges a plurality of laser beam components." Further, Applicants argue that because "Nakazawa et al. teaches only a single laser beam component...there would have been absolutely **NO** motivation to provide...a converging lens that individually converges the laser beam components" (see page 9 of the of the amendment filed September 9, 2003). In response, it should be noted that throughout prosecution of the instant application, it has been shown that Funami *et al.*('653) teach a laser process including, providing a laser beam (2e), splitting said laser by beam splitter (13) (forming a plurality of laser beams) and converging said plurality of laser beams (2f) using a convergent lenses (11) (see Figure 9 and col. 6, line 65 through col. 7, line 4). Specifically, as shown in Figure 9, six converging lenses (11) are present to converge the split beams (2f) that have been split from a single beam (2e).

In response to applicant's arguments against the teachings of JP 10-034365 and Derwent 1988-159505 individually, it should be noted that one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re*

*Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

***Conclusion***

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stefan Staicovici, Ph.D. whose telephone number is (703) 305-0396 (until December 22, 2003) and (571) 272-1208 (after December 23, 2003). The examiner can normally be reached on Monday-Friday 8:00 AM to 5:30 PM and alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael P. Colaianni, can be reached at (703) 305-5493. The fax phone number for this Group is (703) 305-7718.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0661.

Stefan Staicovici, PhD

Primary Examiner 11/15/03

AU 1732

November 15, 2003